biased arm 276 (analogous to arm 76 of FIG. 3) exerts a downward biasing force on the rim 278 of the driving member 254. A bearing 288 supports the shaft 261 and a bearing 290 supports the tubular shaft 260. A screw 292 affixes the shaft 261 to the arm 226. A pin 291 passes through a slot 293 in the shaft 261 and through a sleeve 295 that supports the bearing 288 to prevent the shaft 261 from rotating inside the bearing 288 while permitting vertical motion. Four downwardly-depending posts 294 support a lower housing that supports the shaft 261, cam follower 274 and switch 270. The driving wheel 297 is driven by the shaft 260 and frictionally engages a clutch disc 299 disposed on the bottom of the carousel 212 to form a slip clutch. It should be noted that the carousel could directly contact the driving wheel 297 and thereby also form slip clutch means. Thus, when the driving member 254 is rotated, the carousel 212 is urged for rotation about the shaft 261 by the slip clutch formed by the wheel 297 and the clutch disc 299 or the carousel itself. Also, when the cam 272 is rotated, it moves up and down over the cam follower 274, and raises the carousel 212 and the arm 226 up and down a corresponding amount.

The cam member 272 is illustrated in FIG. 26 and the cam profile of the cam member 272 is illustrated in FIG. 29 in a flattened out or linear presentation similar to that of FIG. 7. When a disc changing operation is initiated, it is initiated in a manner similar to that described in conjunction with the robot arm embodiment. Prior to the initiation of a disc changing operation, the carousel 212 and the arm 226 are in their lowermost positions with the cam follower 274 contacting the cam 272 at a point 300 (left side) on the cam profile of FIG. 28. At this point, the blade 233 is recessed in a slot 400 adjacent the registering block 234 (FIG. 25). As the cam 272 is rotated, the carousel 212 and arm 226 are raised but the carousel does not rotate until a point 306 on the cam profile of FIG. 29 is reached and the blade 233 clears the registering block 234. Until the blade 233 clears the block registering block 234, the carousel 212 is prevented from rotating and slippage between the wheel 297 and the clutch disc 299 occurs. Once the registering block 234 is cleared by the blade 233, friction between the wheel 297 and disc 299 causes the carousel 212 to rotate. The arm 226 does not rotate, but both the arm 226 and the carousel 212 are raised to a point corresponding to a point 308 on the cam profile. The carousel 212 and arm 226 are slowly lowered to an intermediate position from a point 310 to a point 312 where the carousel 212 is in a high enough position to permit the blade 233 to stay above a groove 402, but not high enough to clear the registering block 236. The cam 272 and carousel 212 continue to rotate until a point 312 is reached where the blade 233 engages the registering block 236, the carousel 212 has been rotated 120° and the next receptacle 216 is in position above the playing mechanism 220. When the point 316 is reached, the blade 233 is moving down the slot 404 adjacent the registering block 236. The carousel 212 and the arm 226 are lowered during the travel of the cam 272 between points 316 and 300 so that the blade 233 may be received by the slot 404, thus completing the changing cycle. During this cycle, the cam 272 has rotated a full 360° between points 300 and the carousel has rotated 120°. The arm 226 was raised and lowered, but was retained in place over the playing mechanism 220. The process is repeated during the next changing cycle and the carousel is positioned with the blade 233 received in the slot 408. The changing cycle may be repeated as often as desired.

The changing cycle of the carousel embodiment is initiated in a manner similar to that disclosed in conjunction with the robot embodiment. As the carousel 212 and arm 226 are lowered to their lowermost positions between change cycles, the pin 274 contacts the point 300 of the cam 272 and the depending portion 264 of the member 258 opens a pair of contacts 266 and 268 of a switch 270 (FIG. 26). Thus, the motor (not shown) that drives the driven member 254 is deenergized. To initiate a changing cycle, the motor is energized with a momentary pulse of current of sufficient duration to permit the cam 272 to raise sufficiently to cause the depending portion 264 of member 258 (which does not rotate) to raise sufficiently to allow the switch contacts 266 and 268 to close. After the contacts 266 and 268 have closed, the motor is energized through the closed contacts until the cam makes a complete revolution back to the position shown in FIG. 26, thereby causing the depending portion 264 to be lowered sufficiently to open the contacts 266 and 268. As in the previous embodiment, when the contacts 266 and 268 are open, the control circuitry causes the reading mechanism 220 to determine whether a disc is present. If a disc is present, it is played, and when the play has been completed, an end-of-disc pulse is generated which causes the control electronics to again generate a momentary pulse of current to initiate another changing cycle. If no disc 14 is sensed, the reading mechanism 220 remains idle.

During the changing operation, the arm 226 is raised from the position illustrated in FIG. 25 to the position illustrated in FIG. 27 and returned to the position illustrated in FIG. 25 upon completion of the changing cycle. In the playing position illustrated in FIG. 25, the disc 14 is retained in engagement with a flange 338 on a motor shaft 334 that is driven by a disc driving motor 335. The head 228 is similar to the head 28 in the previous embodiment in that it utilizes a spring 348 to exert a downward bias on the head 228 to retain the disc 14 in place on the flange 338. The spring 348 surrounds a pin 344 that has a head 346 and causes the head 346 to engage a contact point 347 on the interior surface of the housing of the arm 226. The point 347 serves as a pivot point to permit the head 228 to rotate with the disc 14. The head 228 has a centering projection 324 (FIG. 27) that has a conical surface 328 in the end thereof that engages a centering pin 332 extending from the motor shaft. Thus, as the head 228 is lowered into engagement with the flange 338, the pin 332 engages the conical surface 328 that guides the pin 332 into a centering hole 329 and centers the head 228 over the disc 14. The disc 14 is centered by a resiliently mounted centering spindle 333 that is biased upwardly by a low-force compression spring 337. The centering spindle 333 engages the central aperture of the disc 14 as the carousel is lowered over the spindle 333 and centers the disc 14 over the driving flange 338. As the head 228 is lowered, the centering spindle is depressed by the spring 348 to a point sufficient to permit the surface 336 of the head 228 to frictionally retain engagement of the disc 14 to the flange 338.

In the embodiment illustrated in FIGS. 25 and 27, the arm 226 was retained over the play station 212 by the pin 291 that engaged the slot 293 that permitted vertical motion of the arm 226, but prevented the arm 226 from rotating. An alternative way to retain the arm 226 over the play station 212 is illustrated in FIGS. 31 and 32.